

CLAIMS

What is claimed is:

- 1 1. A method for subcarrier allocation and loading for a multi-carrier, multi-subscriber system, comprising:
 - 3 associating at least one cluster in a first set of clusters of subcarriers for use
 - 4 in communication with a first subscriber;
 - 5 associating at least one cluster in a second set of clusters of subcarriers for
 - 6 use in communication with a second subscriber;
 - 7 for each cluster associated for use in communication with the first
 - 8 subscriber and the second subscriber, multiplexing a usage of said each cluster
 - 9 between the first subscriber during a first time division and the second
 - 10 subscriber during a second time division.
- 1 2. The method of claim 1, wherein multiplexing includes assigning said each
- 2 cluster to a one of the first subscriber and the second subscriber that has a highest
- 3 transmission rate of transmission rates of subscribers associated with said each
- 4 cluster.
- 1 3. The method of claim 2, wherein the transmission rates are weighted.

1 4. The method of claim 3, wherein each one of the transmission rates is
2 weighted based on a proportion of time that a subscriber has transmitted on said
3 each cluster.

1 5. The method of claim 1, wherein multiplexing includes periodically
2 reassigning said each cluster to a one of the first subscriber and the second
3 subscriber.

1 6. The method of claim 1, wherein multiplexing includes assigning said each
2 cluster to a one of the first subscriber and the second subscriber based on a
3 probability that the cluster will be used by the first subscriber and a probability
4 that the cluster will be used by the second subscriber.

1 7. The method of claim 1, wherein associating at least one cluster in the first
2 set for use in communication with the first subscriber includes selecting the at
3 least one cluster based on a SINR and a traffic load of each one of the at least one
4 cluster.

1 8. The method of claim 7, wherein the traffic load of each one of the at least
2 one cluster is a queue fullness of a queue associated with that one of the at least
3 one cluster.

1 9. The method of claim 7, wherein selecting the at least one cluster based on
2 a SINR and a traffic load of each one of the at least one cluster includes balancing
3 lengths of queues associated with each one of the at least one cluster.

1 10. The method of claim 1, wherein multiplexing includes assigning said each
2 cluster to a one of the first subscriber and the second subscriber based on a
3 quality of service requirement of the first subscriber and a quality of service
4 requirement of the second subscriber.

1 11. The method of claim 10, wherein assigning includes allocating said each
2 cluster to a one of the first subscriber and the second subscriber having a lower
3 quality of service requirement than that had by another one of the first subscriber
4 and the second subscriber during periods of time in which a one of the first
5 subscriber and the second subscriber having a higher quality of service
6 requirement than that had by another one of the first subscriber and the second
7 subscriber does not transmit on said each cluster.

1 12. The method of claim 1, wherein associating at least one cluster in the first
2 set for use in communication with the first subscriber includes selecting the at
3 least one cluster based on a bandwidth requirement of the first subscriber.

1 13. The method of claim 1, wherein associating at least one cluster in the first
2 set for use in communication with the first subscriber includes selecting a subset
3 of the first set having a least instantaneous delay ratio for the first subscriber of
4 any instantaneous delay ratio for the first subscriber of any subset of the first set.

1 14. The method of claim 1, wherein associating at least one cluster in the first
2 set for use in communication with the first subscriber includes selecting a subset
3 of the first set having a least statistical delay ratio for the first subscriber of any
4 statistical delay ratio for the first subscriber of any subset of the first set.

1 15. The method of claim 1, wherein multiplexing includes:
2 loading data associated with the first subscriber into a queue associated
3 with said each cluster upon determining that a data packet is present in a queue
4 associated with the first subscriber; and
5 loading data associated with the second subscriber into the queue
6 associated with said each cluster upon determining that a data packet is present
7 in a queue associated with the second subscriber.

1 16. The method of claim 15, wherein loading data associated with the first
2 subscriber and loading data associated with the second subscriber includes
3 loading the data associated with a one of the first subscriber and the second
4 subscriber having a higher average transmission rate than that had by another

5 one of the first subscriber and the second subscriber before loading the data
6 associated with a one of the first subscriber and the second subscriber having a
7 lower average transmission rate than that had by another one of the first
8 subscriber and the second subscriber.

1 17. The method of claim 16, wherein the average transmission rate of the first
2 subscriber and the average transmission rate of the second subscriber are
3 weighted.

1 18. The method of claim 16, wherein the average transmission rate of the first
2 subscriber is weighted based on a proportion of time that the first subscriber has
3 transmitted on said each cluster and the average transmission rate of the second
4 subscriber is weighted based on a proportion of time that the second subscriber
5 has transmitted on said each cluster.

1 19. The method of claim 15, wherein loading data associated with the first
2 subscriber and loading data associated with the second subscriber includes
3 loading the data associated with a one of the first subscriber and the second
4 subscriber having a higher quality of service requirement than that had by
5 another one of the first subscriber and the second subscriber before loading the
6 data associated with a one of the first subscriber and the second subscriber

7 having a lower quality of service requirement than that had by another one of
8 the first subscriber and the second subscriber.

1 20. The method of claim 15, wherein loading data associated with the first
2 subscriber into the queue associated with said each cluster includes loading data
3 into a segment of the queue having a lowest delay of any delay of any segment of
4 the queue.

1 21. The method of claim 20, wherein loading data associated with the first
2 subscriber into the queue associated with said each cluster includes loading data
3 into a segment of the queue having a smallest cluster index of any cluster index
4 of any segment of the queue.

1 22. The method of claim 15, wherein loading data associated with the first
2 subscriber into a queue associated with said each cluster includes preempting a
3 loading of data associated with a third subscriber into the queue upon
4 determining that the data associated with the first subscriber has a higher quality
5 of service requirement than that had by the data associated with the third
6 subscriber.

1 23. The method of claim 15, wherein loading data associated with the first
2 subscriber includes loading data having a highest quality of service requirement

3 of any data associated with the first subscriber before loading other data
4 associated with the first subscriber.

1 24. The method of claim 1, wherein multiplexing includes informing the first
2 subscriber of a first time division multiplexing index, corresponding to the first
3 subscriber, for said each cluster, during an allocation phase.

1 25. The method of claim 1, wherein multiplexing includes embedding a time
2 division multiplexing index, corresponding to the first subscriber, in a segment
3 of said each cluster intended for the first subscriber.

1 26. The method of claim 25, wherein the time division multiplexing index
2 corresponding to the first subscriber varies between different ones of the clusters.

1 27. The method of claim 25, wherein embedding the time division
2 multiplexing index includes encoding the time division multiplexing index.

1 28. The method of claim 1, wherein multiplexing includes transmitting, with
2 data intended for the first subscriber that has been loaded into a segment of said
3 each cluster, a preamble for the segment that includes a time division
4 multiplexing index, corresponding to the first subscriber, for said each cluster.

1 29. The method of claim 28, further comprising:
2 the first subscriber receiving the data intended for the first subscriber,
3 with the preamble; and
4 upon the first subscriber recognizing the time division multiplexing index
5 included in the preamble as matching a time division multiplexing index
6 received by the first subscriber during an allocation phase, the first subscriber
7 decoding the data and passing the data to an upper layer.

1 30. The method of claim 1, wherein multiplexing includes scrambling data,
2 intended for the first subscriber, using a scrambling sequence corresponding to a
3 time division multiplexing index, corresponding to the first subscriber, for said
4 each cluster.

1 31. The method of claim 30, further comprising:
2 the first subscriber receiving the data intended for the first subscriber; and
3 upon the first subscriber successfully descrambling the data using the
4 scrambling sequence corresponding to a time division multiplexing index
5 received by the first subscriber during an allocation phase, the first subscriber
6 decoding the data and passing the data to an upper layer.

1 32. A base station, comprising:
2 user data queues to store data transmitted from subscribers;

3 multiplexing logic coupled with the user data queues to receive feedback
4 information from subscribers, to allocate, based on the feedback information, one
5 or more clusters of subcarriers to each subscriber, and to time division multiplex
6 data from the user data queues into cluster data queues corresponding to those
7 of the clusters allocated to more than one subscriber; and
8 the cluster data queues coupled with the multiplexing logic to receive data
9 from the multiplexing logic and store the data for transmission on corresponding
10 clusters of subcarriers.